What is Claimed is:

1. A bi-directional wavelength division multiplexed (WDM) optical communications network having a protection switching capability within two bi-directional optical waveguides, wherein the transmission scheme can accommodate one or more optical signals at distinct wavelengths or bands of wavelengths, each of which can accommodates one or more channels, comprising:

a) two node disjoint bi-directional optical waveguides, each of which is configured to carry one or more of the counterpropagating WDM optical communications signals;

b) optical signal transmitting means, at each end of the network, for transmitting one or more of the WDM optical communications signals having distinct wavelengths or bands of wavelengths;

c) optical signal receiving means, at each end of the network, for receiving one or more WDM optical communications signals having distinct wavelengths or bands of wavelengths other than the wavelengths or bands of wavelengths of the signals sent by the transmitting means located at the same end of the network as said receiving means;

d) coupling means, at each end of the network, for adding the optical signals of the transmitting means at that end of the network to the waveguide and removing the optical signals received at the same end of the network from the waveguide;

e) waveguide failure detection means, connected to the coupling means at each end of the two bi-directional optical waveguides, for detecting a failure of one of the waveguides and switching the transmission path of bi-directional

optical signals from the failed waveguide to the other waveguide, said detection means comprising:

i) a 1x2 optical switch capable of switching one end of the transmission path of one or more optical signals from one bi-directional optical waveguide to the other waveguide;

ii) two optical splitters, one connected to each of the two bi-directional optical waveguides, for tapping optical power received from the optical signals sent by the transmitting means located at the opposite end of the respective waveguide;

iii) an optical filter connected to each splitter that rejects signals of the wavelengths or bands of wavelength transmitted by the transmitter located at the same end of the bi-directional optical waveguides as the filter and accepts signals of the wavelengths or bands of wavelengths transmitted by the transmitter located at the opposite end of the bi-directional optical waveguides;

iv) optical means, connected to each filter, for detecting a drop in the optical power of the optical signals received from the transmitter at the opposite end of the bi-directional optical waveguides; and

v) control electronics for switching one end of the transmission path of the bi-directional optical signals from one bi-directional optical waveguide to the other when an optical power drop is detected in the bi-directional optical signals transmitted along the first bi-directional optical waveguide by the detection means.

2. A bi-directional communications network as in claim **1** having a protection switching capability within two bi-directional waveguides wherein said network

employs any switching, transmission and other communications technology and signal multiplexing scheme, protocol or technology.

3. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **1**, incorporating any network topology.

4. A bi-directional communications network having a protection switching capability within two bi-directional waveguides as in claim **2**, incorporating any network topology.

5. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **1**, wherein an optical path is considered out of service when the received optical signal power measured by the optical detection means is more than 2 dB below the level recorded when the equipment is initially set up.

6. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **1**, wherein each optical splitter taps no less than 1% of the optical power received from the far end of the optical waveguide.

7. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **1**, wherein each optical filter has an isolation effect of at least 4 dB on the wavelength to be rejected.

8. A bi-directional wavelength division multiplexed (WDM) optical communications network having a protection switching capability within two bi-directional optical waveguides, wherein the transmission scheme can accommodate one or more optical signals at distinct wavelengths or bands of

wavelengths, each of which can accommodates one or more channels, comprising:

a) two node disjoint bi-directional optical waveguides, each of which is configured to carry one or more of the counterpropagating WDM optical communications signals;

b) optical signal transmitting means, at each end of the network, for transmitting one or more of the WDM optical communications signals having distinct wavelengths or bands of wavelengths;

c) optical signal receiving means, at each end of the network, for receiving one or more WDM optical communications signals having distinct wavelengths or bands of wavelengths other than the wavelengths or bands of wavelengths of the signals sent by the transmitting means located at the same end of the network as said receiving means;

d) coupling means, at each end of the network, for adding the optical signals of the transmitting means at that end of the network to the waveguide and removing the optical signals received at the same end of the network from the waveguide;

e) waveguide failure detection means, connected to the coupling means at each end of the two bi-directional optical waveguides, for detecting a failure of one of the waveguides and switching the transmission path of bi-directional optical signals from the failed waveguide to the other waveguide, said detection means comprising:

i) a 2x2 optical switch capable of switching one end of the transmission path of an optical signal from one bi-directional optical waveguide to the other waveguide;

ii) two optical splitters, one connected to each of the two bi-directional optical waveguides, for tapping optical power received from the optical signals sent by the transmitting means located at the opposite end of the respective waveguide;

iii) an optical filter connected to each splitter that rejects signals of the wavelengths or bands of wavelength transmitted by the transmitter located at the same end of the bi-directional optical waveguides as the filter and accepts signals of the wavelengths or bands of wavelengths transmitted by the transmitter located at the opposite end of the bi-directional optical waveguides;

iv) optical means, connected to each filter, for detecting a drop in the optical power of the optical signals received from the transmitter at the opposite end of the bi-directional optical waveguides; and

v) control electronics for switching one end of the transmission path of the bi-directional optical signals from one bi-directional optical waveguide to the other when an optical power drop is detected in the bi-directional optical signals transmitted along the first bi-directional optical waveguide by the detection means.

f) additional equipment from the group of equipment comprising dummy lasers, optical transmitters, optical receivers, optical couplers connected to each 2x2 switch to enable either the constant monitoring of the second standby waveguide, provide back up for the optical transmitters, optical receivers and optical couplers connected to the primary waveguide through the switch and/or enable carriage of low priority traffic on the second standby waveguide as long as it is in standby mode.

9. A bi-directional communications network as in claim **8** having a protection switching capability within two bi-directional waveguides wherein said network employs any switching, transmission and other communications technology and signal multiplexing scheme, protocol or technology.

10. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **9**, incorporating any network topology.

11. A bi-directional communications network having a protection switching capability within two bi-directional waveguides as in claim **8**, incorporating any network topology.

12. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **8**, wherein an optical path is considered out of service when the received optical signal power measured by the optical detection means is more than 2 dB below the level recorded when the equipment is initially set up.

13. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **8**, wherein each optical splitter taps no less than 1% of the optical power received from the far end of the optical waveguide.

14. A bi-directional WDM optical communications network having a protection switching capability within two bi-directional optical waveguides as in claim **8**, wherein each optical filter has an isolation effect of at least 4 dB on the wavelength to be rejected.